

CHEMICAL QUANTITIES  
TEST - PART I

Key

Multiple Choice:

Identify the letter of the choice that best completes the statement or answers the question. Mark your answers on the scan-tron form. 2 POINTS EACH

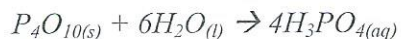
1. Mole ratios for a reaction are obtained from the \_\_\_\_\_.
  - a. Molar masses
  - ☒ b. Periodic Table
  - c. Balanced Chemical Equation
  - d. Subscripts
2. The actual yield of a product is ?
  - a. Always greater than the theoretical yield
  - b. The same as the theoretical yield
  - c. Independent of the reactants
  - ☒ d. Measured experimentally
3. Calculating the mass of a reactant and product from the number of moles of another product or reactant in a chemical equation is an example of a?
  - a. Mass to mass conversion
  - ☒ b. Mole to mass conversion
  - c. Mass to mole conversion
  - d. Mole to mole conversion
4. Stoichiometry is based on the law of conservation of \_\_\_\_\_.
  - ☒ a. mass
  - b. volume
  - c. charge
  - d. moles
5. What is the molar mass of  $\text{Pb}(\text{NO}_3)_2$ ?

$\text{Pb} + 2(\text{N}) + 6(\text{O})$   
 $207.2 + 2(14.01) + 6(16.0)$

  - a. 237.21 g
  - b. 315.22 g
  - c. 538.42 g
  - ☒ d. 331.22 g
6. What is the volume of one mole of any gas at STP?
  - a. 1.0L
  - ☒ b. 22.4L
  - c. The molar mass of the gas
  - d.  $6.02 \times 10^{23}$  L
7. What is STP?
  - a. Standard temperature and pressure
  - b.  $0^\circ\text{C}$  and 1atm
  - ☒ c. The conditions under which 1 mole of a gas is equal to 22.4L
  - d. All of the above

not needed for quest

8. How many moles of  $\text{H}_3\text{PO}_4$  are produced when 71.0 grams of  $\text{P}_4\text{O}_{10}$  reacts completely with water?



- a. 16.0 mol
- b. 0.0635 mol
- c. 1.00 mol
- d. 4.00 mol

$$71.0\text{g} \left( \frac{1\text{mol P}_4\text{O}_{10}}{284\text{g}} \right) \left( \frac{4\text{mol H}_3\text{PO}_4}{1\text{mol P}_4\text{O}_{10}} \right) = 1\text{mol H}_3\text{PO}_4$$

9. What is the percent yield of  $\text{P}_2\text{O}_5$  if the theoretical yield is 6.4g and the amount produced in the lab is 4.2g in the following reaction?



- a. 152%
- b. 26.88%
- c. 100%
- d. 66%

$$\frac{4.2}{6.4} \times 100 = 66\%$$

10. Which of the following is a practical application of stoichiometry?

- a. Calculating the mass of gold that can be filtered from a liter of stream water
- b. Calculating the mass of water vapor that is formed when 1L of water evaporates
- c. Calculating the volume of carbon dioxide is produced when a liter of gas combusts
- d. Calculating the mass of salt that crystallizes from a liter of salt solution

→ The only chemical process.  
Stoichiometry does not apply to physical processes.

NAME: \_\_\_\_\_

Score: \_\_\_\_\_ / 65  
Chemistry 313  
Chapter 12

**CHEMICAL QUANTITIES**  
**TEST – PART II**

Short Answer & Problem-Solving:

Correctly answer the following questions. Show all of your work when necessary. Don't forget to include units with any mathematical calculation and to round any numerical answer to the correct number of significant figures!

11. Complete each sentence or statement using terms from the word bank below.

2 POINTS EACH

actual yield

formula unit

molecule

percent yield

theoretical yield

- a. percent yield is the ratio of the actual yield to the theoretical yield.
- b. The theoretical yield is the calculated amount of product formed during a reaction.
- c. The smallest unit of a molecular compound is a(n) molecule.
- d. The smallest unit of an ionic compound is a(n) formula unit.
- e. The amount of product formed when a reaction is carried out in the laboratory is called the actual yield.

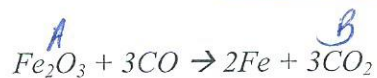
12. When reacting sodium hydroxide with hydrochloric acid (HCl), the theoretical yield of NaCl produced is 98.4 grams. However, when conducting the experiment in the lab, the actual yield was 96.1 grams. What is the percent yield of NaCl?

5 POINTS

$$\frac{96.1}{98.4} \times 100 = 98\%$$

13. Determine the number of moles of  $\text{CO}_2$  produced with 8.72 moles of  $\text{Fe}_2\text{O}_3$  react with carbon monoxide.

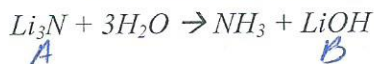
5 POINTS



$$8.72 \text{ mol } A \left( \frac{3 \text{ mol } B}{1 \text{ mol } A} \right) = 26.16 \text{ mol } \text{CO}_2$$

14. Determine the mass of  $\text{LiOH}$  produced when 0.47 grams of  $\text{Li}_3\text{N}$  reacts with water.

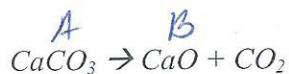
5 POINTS



$$0.47 \text{ g } A \left( \frac{1 \text{ mol } A}{35 \text{ g } A} \right) \left( \frac{1 \text{ mol } B}{1 \text{ mol } A} \right) \left( \frac{24 \text{ g } B}{1 \text{ mol } B} \right) = 0.32 \text{ g } \text{LiOH}$$

15. Calcium carbonate is decomposed by heating. Determine the theoretical yield of  $\text{CaO}$  if 24.8 grams of calcium carbonate ( $\text{CaCO}_3$ ) is reacted. What is the percent yield if 1.31 grams of calcium oxide is actually produced in the lab?

5 POINTS



↳ actual yield = 1.31g

$$24.8 \text{ g } A \left( \frac{1 \text{ mol } A}{100 \text{ g } A} \right) \left( \frac{1 \text{ mol } B}{1 \text{ mol } A} \right) \left( \frac{56 \text{ g } B}{1 \text{ mol } B} \right) = 13.9 \text{ g } B$$

$$\frac{1.31}{13.9} \times 100 = \boxed{9\%}$$